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## PATENT SPECIFICATION



Application Date: Sept. 30, 1936. No. 26523/36.

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(Under Section 16 of the Patents and Designs Acts, 1907 to 1932.)

Specification Accepted: Feb. 8, 1938.

### PROVISIONAL SPECIFICATION

No. 26523 A.D. 1936.

#### Improvements in Electrodes for Sparking Plugs

We, ALAN RICHARD POWELL and ERNEST ROBERT BOX, both British Subjects, and JOHNSON, MATTHEY & COMPANY LIMITED, a British Company, all of 78, Hatton Garden, in the City of London, do hereby declare the nature of this invention to be as follows:—

This invention relates to metal electrodes for sparking plugs.

- 10 It has already been proposed to use platinum, either alone or alloyed with up to 30 per cent. of iridium, for electrodes of the said kind, and the electrodes thus obtained have been found to have a longer life than the base-metal electrodes previously used but they eventually break down owing to corrosion by the lead compounds normally added to high grade motor spirits to prevent knocking and owing to recrystallisation at the high temperatures (about 1200° Centigrade).

We have now found that the said difficulties can be overcome and the life of the electrodes considerably increased by using metals of the platinum group or

alloys thereof which are relatively highly resistant to attack by lead and its compounds and have a very high recrystallisation temperature. Such metals and alloys comprise iridium and alloys thereof with platinum or rhodium or both containing at least one atomic equivalent of iridium for every atomic equivalent of platinum and/or rhodium present. Pure iridium and alloys of iridium with platinum and/or rhodium in which the atomic ratio iridium: platinum + rhodium is not less than 1:1 are particularly resistant to attack by lead and its compounds at temperatures up to from 1400° to 1500° Centigrade.

The metals or alloys according to this invention may be used as point electrodes, in the form of wire or as tips applied to a base metal foundation.

Dated this 30th day of September, 1936.

J. Y. & G. W. JOHNSON,  
47, Lincoln's Inn Fields,  
London, W.C.2.  
Agents.

### PROVISIONAL SPECIFICATION

No. 26524 A.D. 1936.

#### Improvements in Electrodes for Sparking Plugs

We, ALAN RICHARD POWELL and ERNEST ROBERT BOX, both British Subjects, and JOHNSON, MATTHEY & COMPANY LIMITED, a British Company, all of 78, Hatton Garden, in the City of London, do hereby declare the nature of this invention to be as follows:—

This invention relates to metal electrodes for sparking plugs

- 10 It has already been proposed to use platinum, either alone or alloyed with up to 30 per cent. of iridium, for electrodes of the said kind, and the electrodes thus obtained have been found to have a longer life than the base-metal electrodes previously used but they eventually break down owing to corrosion by the lead compounds normally added

to high grade motor spirits to prevent knocking and owing to recrystallisation at the high temperatures (about 1200° Centigrade).

We have now found that the said difficulties can be overcome and the life of the electrodes considerably increased by using metals of the platinum group or alloys thereof which are relatively highly resistant to attack by lead and its compounds and have a very high recrystallisation temperature. Such metals and alloys thereof with platinum or rhodium or both containing at least one atomic equivalent of ruthenium and/or osmium for every atomic equivalent of platinum and/or rhodium present. Pure ruthenium and osmium

and alloys of the same with platinum and/or rhodium in which the atomic ratio ruthenium and/or osmium: platinum + rhodium is not less than 1:1  
 5 are particularly resistant to attack by lead at temperatures up to 1400° to 1500° Centigrade. Part of the ruthenium and/or osmium may be replaced by a corresponding amount of iridium.  
 10 The metals or alloys according to this

invention may be used as point electrodes, in the form of wire or as tips applied to a base metal foundation.

Dated this 30th day of September, 1936.

J. Y. & G. W. JOHNSON,  
 47, Lincoln's Inn Fields,  
 London, W.C.2.  
 Agents.

#### COMPLETE SPECIFICATION.

##### Improvements in Electrodes for Sparking Plugs

We, ALAN RICHARD POWELL and ERNEST ROBERT BOX, both British Subjects, and JOHNSON, MATTHEY & COMPANY LIMITED, a British Company, all of 78, Hatton Garden, in the City of London, do hereby declare the nature of  
 20 this invention and in what manner the same is to be performed to be particularly described and ascertained in and by the following statement:—

This invention relates to metal electrodes for sparking plugs.

It has already been proposed to use platinum, either alone or alloyed with up to 30 per cent. of iridium, for electrodes for sparking plugs, and the electrodes thus obtained have been found to have a longer life than the base metal electrodes previously used but they eventually break down owing to (1) corrosion by the lead compounds normally  
 30 added to high grade motor spirits to prevent knocking, (2) absorption of carbon from the oil and (3) recrystallisation at the high temperatures (about 1200° Centigrade).

It has also been proposed to coat electrodes for sparking plugs with platinum, iridium, iridio-platinum or like material by electro deposition so that a thin even coat may be spread over the electrode.  
 45 In modern internal combustion engines the coating on such electrodes flakes off after a very short time.

We have now found that the said difficulties can be overcome and the life of the electrodes considerably increased by using iridium and/or ruthenium, and alloys of iridium, ruthenium and/or osmium with platinum or rhodium or both containing at least one atomic equivalent of iridium, ruthenium and/or  
 50 osmium for every atomic equivalent of platinum and/or rhodium. The said metals and alloys are particularly

resistant to attack by lead and carbon and to recrystallisation at temperatures up to 60 1400° to 1500° Centigrade.

The metals or alloys according to this invention may be used as tips applied to a base metal foundation or as point electrodes, in the form of wire. 65

The following table gives the compositions of some alloys which have been found especially suitable as sparking plug electrodes:—

Iridium	Ruthenium	Osmium	Platinum	
%	%	%	%	70
50	—	—	50	
—	35	—	65	
30	—	20	50	
40	10	—	50	75

Up to 20 per cent. of the platinum in the above table may be replaced by an equivalent amount of rhodium.

Having now particularly described and ascertained the nature of our said invention and in what manner the same is to be performed we declare that what we claim is:—

1. An electrode for a sparking plug consisting of or tipped with iridium and/or ruthenium. 85

2. An electrode for a sparking plug consisting of or tipped with an alloy of at least one atomic equivalent of iridium, ruthenium and/or osmium with one atomic equivalent of platinum and/or rhodium. 90

3. Electrodes for sparking plugs consisting of or tipped with the alloys enumerated in the foregoing table. 95

Dated this 30th day of September, 1937.

J. Y. & G. W. JOHNSON,  
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 Agents.